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PCT/IL2006/000324

29 MAR 2006

PA 1440729

# THE UNITED STATES OF AMERICA

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**United States Patent and Trademark Office**

**March 17, 2006**

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**APPLICATION NUMBER: 60/661,795**

**FILING DATE: March 14, 2005**

**THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US60/661,795**

**By Authority of the**

**Under Secretary of Commerce for Intellectual Property  
and Director of the United States Patent and Trademark Office**



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**Certifying Officer**

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PTO/SB/16 (8-00)

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**PROVISIONAL APPLICATION FOR PATENT COVER SHEET**  
This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

INVENTOR(S)					
Given Name (first and middle (if any))		Family Name or Surname		Residence (City and either State or Foreign Country)	
Gennady		BABITSKY		6/29 Hashikma Street Nesher 36812 Israel	
<input checked="" type="checkbox"/> Additional inventors are being named on the <u>1</u> separately numbered sheets attached hereto.					
TITLE OF THE INVENTION (280 characters max)					
BROADBAND LAND MOBILE ANTENNA					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
<input type="checkbox"/> Customer Number				Place Customer Number Bar Code Label here	
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<input checked="" type="checkbox"/> Firm or Individual Name		ABELMAN, FRAYNE & SCHWAB Attorneys at Law			
Address		150 East 42 <sup>nd</sup> Street			
Address		New York, New York 10017			
City		State		Zip	
Country		U.S.A.	Telephone	(212) 949-9022	Fax (212) 949-9190
ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification		Number of Pages		<u>2</u>	<input type="checkbox"/> CD(s), Number
<input checked="" type="checkbox"/> Drawing(s)		Number of sheets		<u>1</u>	<input type="checkbox"/> Other (specify)
<input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76					
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one)					
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.					
<input checked="" type="checkbox"/> A check or money order is enclosed to cover the filing fees					
<input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: <u>01-0035</u>					
<input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.					
FILING FEE AMOUNT (\$) <u>\$200.00</u>					
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.					
<input checked="" type="checkbox"/> No.					
<input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are: _____					

Respectfully submitted,

SIGNATURE

TYPED or PRINTED NAME

TELEPHONE

Jay S. Cinamon

(212) 949-9022

Date

March 14, 2005

REGISTRATION NO.

24,156

(if appropriate)

Docket Number:

206,911

**USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT**

**STATEMENT OF FILING BY EXPRESS MAIL 37 C.F.R. § 1.10**

This correspondence is being deposited with the United States Postal Service on March 14, 2005 in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number ER 842 050 574 US addressed to the Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450.

**PROVISIONAL APPLICATION COVER SHEET**  
**Additional Page**

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Docket Number		206,911	Type a plus sign (+) inside this box →	+
INVENTOR(S) APPLICANT(S)				
Given Name (first and middle (if any))	Family or Surname	Residence (City and either State or Foreign Country)		
Matti	MARTISKAINEN	P.O. Box 3392 Tiberias Illit 14154 Israel		

Number 2 of 2

## SPECIFICATION

- A. Title/Subject Matter of the Invention:** Broadband Land Mobile Antenna
- B. Persons Who Contributed to or Worked on the Invention:** Gennady Babitsky, Matti Martiskainen
- C. Purpose of the Invention:** To create a small, inexpensive broadband antenna covering the required range without changing the antenna according to needed channel.
- D. A summary of invention: How does the present invention solve the problem; what are the differences between this solution and the prior solutions; and what are the advantages provided by the invention:**

Land Mobile Applications operate on relative low frequencies. Therefore the size of the portable device antenna needs to be reduced and the solution is typically a helical antenna. However the helical antenna exhibits a large reactance causing the bandwidth to be reduced. In order to cover the whole required band antenna has to include some type of matching circuitry. These antennas have to be very rugged in use and matching circuit with lumped components is not a good solution. One typical solution to broadband antennas is to use a  $\frac{1}{4}$  wave long impedance transformer in the feed of the antenna. The impedance transformer needs to be designed to provide the needed change between the impedance of the phone (50 Ohm) and the antenna impedance. The structure of the  $\frac{1}{4}$  wave impedance transformer is just  $\frac{1}{4}$  wave long piece of transmission line with suitable characteristic impedance.

U.S. Patent 4772895 (Garay et al) describes a wide-band helical antenna having a second helically configured conductive element around the bottom part of the helical antenna element in order to broadband the antenna.

In the invention described here, we use a conductive pipe surrounding the bottom part of the helical antenna element. The pitch of the helical in this area is most likely different from pitch outside the pipe. In both designs a spacer isolates the helical antenna from the surrounding element (a second helically configured conductive element or a conductive pipe). The spacer has to be relatively thin in order to allow strong coupling between the helical antenna element and the surrounding element.

The presented invention provides a mechanically strong, easy to produce, low cost design.

**E. Description of the invention**

The antenna consists of a helical radiating element (1) fed by center conductor (2) of a coaxial connector (3). A conductive stud (4) galvanically connects the center

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conductor to the helical radiating element. A dielectric insert with groove (5) controls the pitch of the bottom part of helical radiating element. A relatively thin spacer (6) surrounds the bottom part of the helical radiating element. A conductive pipe (7) surrounds the spacer. One end of the conductive pipe is connected to the ground of the coaxial connector (3). The pitch of the helical radiating element in this area is most likely different from the pitch outside the conductive pipe. The conductive pipe is connected to the ground of coaxial connector by a reliable means -like thread or crimp- and the dielectric insert - helical radiating element - spacer - conductive pipe assembly is secured by a long crimp providing stability.

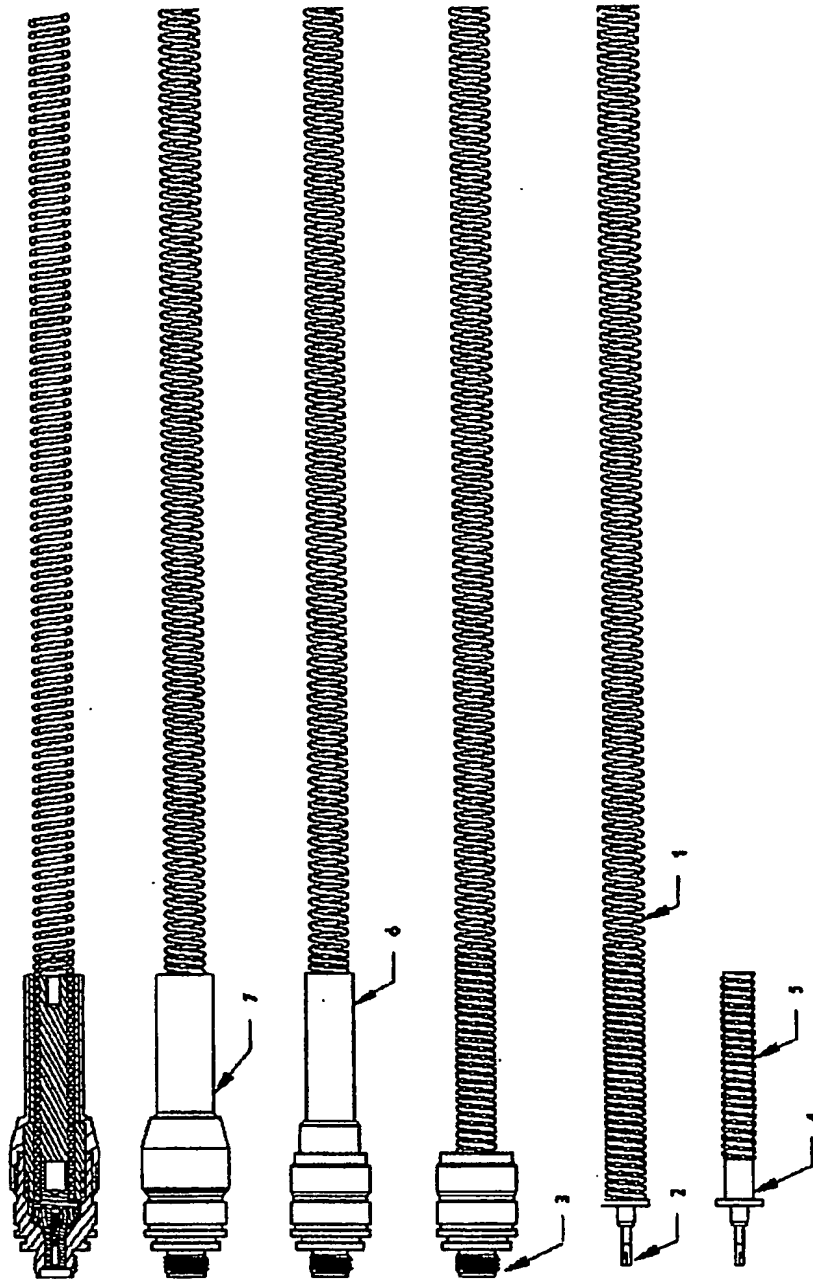
**F. Differences Between Invention and Other Systems or Methods:**

In the invention described here, we use a variation of a reduced length transmission line to create a broadband antenna. A typical transmission line has an electrical length of  $\frac{1}{4}$  wave of the operating frequency for matching purposes. The physical length of this structure is about 70 % of it. For the operating frequencies considered for this invention, the  $\frac{1}{4}$  wave length is about 1/2 meter. In the current design the length of the transmission line has been reduced in order allows the antenna to be used for hand held applications. The transmission line is created by the mechanical structure contained within the pipe described above. This pipe structure has the necessary electrical length (defined by the number of turns, coil diameter, wire diameter, pitch of the coil, dielectric constant of the insert and spacer, thickness of the spacer and the length of the grounded pipe) to function as a  $\frac{1}{4}$  wave impedance transformer. The pipe structure can be designed to function as a  $\frac{3}{4}$  wave transmission line (necessarily having a longer length). Unlike typical transmission lines, this type of transmission line has 'a characteristic impedance' that varies as a function of frequency. The change in 'the characteristic impedance' follows the change in the antenna impedance in operating frequencies allowing matching even on broader bandwidth. Having a sealed structure not allowing overmolding material to enter this critical area controls the loss of the matching structure. The design with second helically configured conductive element cannot be sealed. The benefit of this construction is that the bandwidth of the antenna is significantly increased compared to helical antennas without matching circuitry and the overall size of the antenna remains small.

**G. Prior Art:**

US Patent 4,772,895 Wide-band Helical Antenna

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